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THE TRAINING OF SKILLED WORKERS, REPORT ON A SAMPLE INQUIRY INTO THE BACKGROUND, TRAINING AND PRESENT OCCUPATIONS OF SKILLED WORKERS IN THE MECHANICAL ENGINEERING INDUSTRY OF FOUR COUNTRIES.

ORGANISATION FOR ECONOMIC COOPERATION AND DEV.

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AN INTENSIVE STUDY OF TWO SAMPLES DRAWN FROM ONE GEOGRAPHIC AREA IN EACH OF FOUR COUNTRIES AIMED TO DETERMINE THE TRAINING AND JOB HISTORIES OF SKILLED WORKERS IN THE METAL TRADES AND THE RESULTS OBTAINED BY DIFFERENT TRAINING SYSTEMS. THE COUNTRIES WERE SELECTED TO REPRESENT (1) PREDOMINANTLY SCHOOL-BASED TRAINING (BELGIUM), (2) HIGHLY REGULATED APPRENTICE TRAINING (GERMANY), (3) COMBINED SCHOOL-APPRENTICE TRAINING (THE NETHERLANDS), AND (4) LOOSELY CONTROLLED APPRENTICESHIP (UNITED KINGDOM). THE SAMPLES WERE COMPOSED OF PERSONS WHO HAD PASSED SKILLED-WORKER METAL TRADES EXAMINATIONS IN 1958 (IN BELGIUM, 1955), AND SKILLED WORKERS AGED 21-29 WHO WERE EMPLOYED IN THE METAL TRADES IN 1963. THE INFORMATION INDICATED THAT ACCEPTED NORMS AND CONCEPTS RELATING TO VOCATIONAL TRAINING WERE NOT ALWAYS BORNE OUT BY THE REAL SITUATION, AND THAT DIFFERENCES BETWEEN COUNTRIES WERE NOT NEARLY SO GREAT AS COMMONLY BELIEVED AND RELATE TO DETAILS RATHER THAN TO BASIC PRINCIPLES. IN THREE OF THE FOUR COUNTRIES, THE TRAINING SYSTEMS WERE CHANGING RAPIDLY. THE CHANGE APPEARED TO BE IN THE DIRECTION OF THE SYSTEM EXISTING IN THE NETHERLANDS. THREE STAGES WERE CRYSTALLIZING AS DISTINCT PERIODS IN THE TRAINING PROCESS--A PERIOD OF ORIENTATION, A PERIOD OF FORMATIVE TRAINING, AND A PERIOD OF SPECIALIZATION. WASTAGE IN TRAINING, THE PROPORTION OF WORKERS WHO EVENTUALLY ENTER OCCUPATIONS OTHER THAN THOSE FOR WHICH THEY WERE TRAINED OR WHO ENTER MORE NARROWLY SPECIALIZED OCCUPATIONS, WAS HIGH IN ALL FOUR COUNTRIES. A SMALLER PROPORTION OF THE UNITED KINGDOM THAN THE GERMAN APPRENTICES HAD BROAD SKILLS AND HIGH LEVEL TRAINING. THE PROPORTION OF TRAINEES GOING ON TO TECHNICIAN TRAINING COURSES WAS HIGH IN GERMANY AND THE NETHERLANDS AND RELATIVELY LOW IN THE TWO OTHER COUNTRIES. (EM)

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The training of skilled workers

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THE TRAINING OF SKILLED WORKERS

Report on a sample inquiry into the background, training and present occupations of skilled workers in the mechanical engineering industry of four countries, conducted by the International Vocational Training Information and Research Centre (C.I.R.F./I.L.O.).

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AND DEVELOPMENT

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PREFACE

The main goal of the Manpower and Social Affairs Committee is to promote, in the Member countries of O.E.C.D., an "active" manpower policy which fits into the whole range of measures designed to bring about economic growth with stability of prices. In the longer run, this manpower policy must help the labour market to adapt itself to increasingly rapid changes in technology and structure.

The vocational training of manpower is one of the ways of bringing about this adaptation. The content and methods of this training should, in turn, be adapted to changing conditions.

With this in mind the Committee decided to study a number of different aspects of vocational training(1).

This study, entitled "The Training of Skilled Workers", was made by the "CIRF", the International Vocational Training Information and Research Centre of the International Labour Office in Geneva, acting as consultant to O.E.C.D. It is a comparative study of how skilled workers are trained for the metal trades in four of O.E.C.D.'s highly industrialised Member countries, namely Belgium, the Federal Republic of Germany, the Netherlands and the United Kingdom.

The O.E.C.D. wishes to place on record the important contributions made to this study by the national counterparts who co-operated with the CIRF in carrying out the study. They were Monsieur V. Martin for Belgium, Dr. Lutz, Dr. E. Krause and Mr. Leimig for the Federal Republic of Germany, Mr. F.G.W. Fabius, Netherlands, and for the United Kingdom Mr. E.G. Sterland.

(1) See "The Accelerated Vocational Training of Adults" by Victor Martin, and "Retraining and Further Training" by Dr. Gil Schonning.

I. INTRODUCTION

1. Skilled worker training systems

Several basically different methods are used in the various European countries in organising the training of skilled workers for industry. In some, as for instance in Belgium, the majority of future craftsmen taking up work at skilled worker level in industry have received all their training at school, starting already during the period of compulsory education.

In other countries, as in the United Kingdom and the Federal Republic of Germany, training follows compulsory education under a system of apprenticeship. In the Netherlands, and in some other countries, a mixed system of basic training in schools, during the final years of compulsory schooling, and further training in apprenticeship on the job, with or without indenture, is the principal source of craftsmen for work in industry.

The systems of vocational training also differ in their relationships with other parts of the over-all system of vocational and technical education. In Belgium, for instance, technicians recruited among secondary-school students are trained in special streams separate from the vocational streams. Facilities are available for persons employed in industry or elsewhere to acquire recognised qualifications at the technician or higher technician level by attending night school; only relatively few avail themselves of this opportunity.

In the Federal Republic of Germany, on the other hand, full training as a skilled worker is, in most cases, a prerequisite for entry into the technician and higher technician training institutes (Fachschule and Ingenieurschule).

In the United Kingdom, craftsman and technician training are parallel. All trainees, except some "student" and "graduate" apprentices, receive the same basic training. There is an increasing tendency to engage boys as technician apprentices, and send them to special technician courses at technical colleges. Sometimes, however, all boys start as craft apprentices and separation into different streams takes place after some two years of craft experience and after passing the City and Guilds of London Institute intermediate examination or other examinations at a corresponding level. The future craftsmen, after this initial period, follow higher craft courses or finish their technical college studies. The future technicians take courses for obtaining qualifications at the ordinary or higher national certificate levels.

2. The aims of this research

The aim of the present project was to discover whether there were any significant differences in the results obtained by the systems described.

No comparative research has previously been done in this field. Moreover, little systematic information is available regarding the manner in which skilled workers in industry in various countries have, in fact, received their training.

The project consequently had to break new ground. It had to be made a pilot investigation, designed with a view to exploring methods of research and comparison rather than to finding definite and conclusive answers to the principal technical questions raised.

3. The hypothesis

In designing the project it was assumed that substantial information of the type and on the points indicated below could be collected at the local (school and plant) level and would permit an evaluation of the relative efficiency of different types of training systems and provide a basis for international comparison.

(1) Data on the qualifications obtained by a trainee at school and in apprenticeship, and on his position or status in employment a few years later.

(2) Data on the extent to which trainees and their employers take steps to supplement the training given during school or in apprenticeship in order to fit or adapt it to the skill requirements of industry.

(3) Data on the frequency of job changes or changes of employer.

(4) Data on the arrangements made within the undertakings for training their employees; type, organisation, duration, etc. of training.

(5) In countries which do not have official standard syllabi for training on the job, data on the actual rotation system applied by the undertakings for training their apprentices and young workers.

Specifically, it was assumed that the above information would suggest characteristic traits of the systems and allow for some measure of comparison in regard to:

(1) the efficiency of the different types of training in providing the type of manpower required by industry;

(2) the degree to which the training given fostered intellectual interest, a desire for promotion and job satisfaction among the trainees and young workers;

(3) the motivation of employers for devoting time, effort and money to carrying out training programmes;

(4) certain trends in the development of private training action;

(5) the national concept of the qualifications and experience expected of the skilled worker.

4. The scope

To ensure rapid implementation and the greatest measure of comparability, the study was limited to the principal crafts in the metal trades - toolmakers, fitters, mechanics and machinists.

It was also limited to four geographical areas: Malines (Mechelen) in Belgium, Karlsruhe in the Federal Republic of Germany, Dordrecht in the Netherlands and Bristol in the United Kingdom.

5. The questions

In these four areas an attempt was made to find answers to two basic questions:

(a) What had become of the trainees who completed their training some years ago:

- Were they still working as craftsmen in the metal trades?
- Had they changed employer?
- Had they gained promotion?
- Had they taken further training in their own trade, or with a view to promotion?

- Had their employers found it necessary or desirable to give them supplementary training and, if so, for what specific purpose?

(b) How had the young craftsmen, now working in industrial undertakings, acquired their basic and further training and subsequent experience:

- Did the pattern of their training conform to current concepts of the "normal" pattern applying in each country?
- Had their original training been supplemented - on their own or their employer's initiative - by further training courses, or by work assignments principally for training purposes, after the end of the officially recognised period of training?

6. The method

To find answers to these and related questions in each of the four areas, two approaches were used:

(1) Vocational schools and other institutions which could be assumed to have reasonably complete records were asked to supply lists of the boys who had completed their training in the year 1958 (in Belgium 1955), with details on their training, marks received and other data available. Wherever possible, the records of the careers, training and experience of these boys were then followed up to their present-day employment.

(2) A sample of employers were asked to supply, in co-operation with the craftsmen concerned, detailed information about young craftsmen employed by them, their records of basic training and further job experience, courses taken, etc. A standard questionnaire (See Annex) was prepared.

The field studies were carried out in the period of September to December 1963. Implementation of the project began in 1963 when representatives of three of the participating countries met at the O.E.C.D. in Paris to discuss the purpose, the plan of action, and the methods to be used. The meeting also determined the limitations which would have to be applied if the principal objectives of the project were to be attained within the relatively short space of time available.

7. The limitations

It was soon found that three factors would greatly affect and even limit the results obtainable in the enquiry.

Firstly, there were substantial differences between the countries as regards the age at which recognised skilled-worker qualifications are obtainable. The two extremes were 16 years of age in Belgium and 21 in the United Kingdom. It was consequently difficult to select an age group which would both permit international comparison of career prospects to be really significant and give some hope of locating a sufficiently substantial proportion of the former trainees. The range aimed at was 21 to 29 years.

Secondly, national research officers tended to interpret their instructions very freely and to deviate from the standard questionnaire to such an extent that comparison of the data assembled was made difficult and in some respects impossible. Founded on assumed or real differences between the patterns of training applying in the four countries, these deviations had to be accepted because of the short time available for the field studies.

A third problem was that, in many cases, records regarding former trainees proved to be lacking and, with the exception of Belgium, only a relatively small percentage of case studies could be followed up into their present-day employment. In the United Kingdom such a follow-up was only found possible in the case of boys who had remained with their first employer. In all four countries, therefore, the material gathered in the first phase ("Class '58") became biased in favour of those who were stable in their employment and who had remained in the trade and area of their original training.

Yet another reservation should be recorded: the four research areas had been selected as representative of regions with an extensive and well organised mechanical engineering industry requiring continuous renewal of its cadres of highly qualified craftsmen in the metal trades and well served by a network of vocational schools and technical colleges. The training pattern is bound to be quite different in areas in which other types of economic activity are dominant, or in which vocational training is less developed.

The main responsibility for gathering the data fell on four local research officers who worked under the general guidance of national co-ordinators and in close contact with CIRF's research staff.

The data were then sent to CIRF, which undertook the statistical and technical analysis of the material in close co-operation with experts working at the national level.

8. The "skilled worker" concept

It must also be emphasised that the "skilled worker" concept is the subject of widely differing interpretation - between the four countries as well as between undertakings within the countries.

In some cases - particularly in the Federal Republic of Germany - the tendency is to consider all those who have completed a recognised course of apprenticeship as being in the skilled craftsman category. Those, on the other hand, who have acquired a similar level of skill and knowledge without formal apprenticeship are not accepted as skilled workers.

The sometimes rigid wage systems, the shortage of manpower in specialised and skilled occupations, and technical change have combined to make it difficult to trace the border-lines between semi-skilled and skilled work. In some cases, workers who are carrying out work for which only a relatively short period of training would normally be required are classified and remunerated as skilled workers, particularly if they had at one time obtained recognised qualifications.

The reasons may be historical (traditionally skilled crafts, which have been simplified by technical change) or mere expedience (attempts on the part of employers to relieve shortages and attract new recruits by upgrading a semi-skilled job into a skilled wage category). This was illustrated by the findings in the Netherlands where about half the workers included in the sample, all placed in the skilled and high skilled wage categories IV and V in the existing wage classification, were performing work which, in other firms, might be classified as semi-skilled only. This observation was corroborated by statements made by both employers and workers in interviews and questionnaire replies.

This lack of homogeneity of the skilled worker categories applies also to the workers included in the other countries. While many of the apprentices in the United Kingdom sample, for instance, had received a varied and comprehensive training during their period of apprenticeship, others had obviously just "served their time". The skill level reached by them can hardly be said to correspond to that of the traditional polyvalent craftsman, when all their five years of training - except perhaps for a short

introductory period of basic training - was spent running one single type of machine or performing a limited set of operations in assembly or inspection.

9. The training period and qualifications acquired later

As shown in the Belgian sample, and evidenced also in several curricula vitae supplied by the workers in Bristol, both workers and undertakings are, in many cases, "correcting" the training records also after the end of training. Graduates of A4 schools in Belgium, who would normally go into semi-skilled occupations (see below in Chapter III), have been given further training during their first years of employment to qualify for work as fully skilled craftsmen, whereas some of the A3 school graduates, in principle already qualified for skilled level work, have gone into semi-skilled jobs.

One example out of the United Kingdom group will amply illustrate the attitude of employers in this respect and the danger of assuming that the period of apprenticeship would always be regarded as essentially the sole period of training to the craftsman level. One of the persons classified by the employers as a "draughtsman" which in the United Kingdom is generally considered a skilled occupation, had spent 22 months at the fitter's bench and 26 months in the laboratory during his apprenticeship. The remaining 12 months in his total of 60 months of training were devoted to basic training (4 months), turning (3 months) and other manual work. It was only after a further period of training and practical experience (12 months in maintenance and 12 months in planning) that he started his first drawing office training to become a jig and tool draughtsman.

The case may be somewhat exceptional as this man, during the same period, had also qualified as a technician by acquiring a Higher National Certificate. Other cases in the United Kingdom sample, however, suggest the same conclusions. During their apprenticeship the other draughtsmen had spent periods varying anywhere from one month to 38 months in the drawing office.

II. THE TRAINING PATTERN

The principal features of the officially recognised patterns of training for industrial occupations applying in the countries of the study are brought together in the table below. Training for non-industrial employment, e.g. for the artisan trades, office occupations, and agriculture may follow other patterns.

As will be shown in some detail in subsequent parts of the report the officially recognised "system" or pattern of vocational training is modified in mainly three ways.

(1) An employer may consider a worker as having attained skilled craftsman level even without the latter having completed the full cycle of training at school or in apprenticeship. This applies, in particular, to countries in which recognition as a skilled worker may be obtained only by an officially recognised examination. Age restrictions and other limitations, such as allowing only trainees having completed certain courses or a specified period of on-the-job training under a contract of apprenticeship to sit for the examinations, make it impossible for persons otherwise trained to attain official recognition. It is sometimes the practice in such countries for employers to recognise an employee as a skilled worker without insisting on the official examination. Such private recognition is valid only within the undertaking and any resultant advantages are lost if the worker goes to another firm.

(2) The employer, or several employers working together, often modify the normal pattern of training, e.g. by replacing training on the job partly or entirely by training in a company-owned school or training bay, or in an independent training centre.

(3) Recognition as a skilled worker may, in some countries, also be acquired by adults who have gone through special courses of accelerated training or have served an apprenticeship at a higher age. No such cases were found in the four studies included in the present project.

	Belgium	Fed. Rep. of Germany	Netherlands	United Kingdom
Compulsory school-leaving age	14	14-15 ⁽¹⁾	14	15
Age at which vocational training may begin	12 ⁽²⁾	14-15 ⁽¹⁾	12 ⁽²⁾	16 ⁽³⁾
Minimum duration of training for skilled craftsmen	4 years	3 years	4 years	5 years
Maximum duration of training (indenture period in apprenticeship) for successful trainees	5 years	3.5 years	5 years	5 years
Period of full-time training at vocational school	complete training at vocational school	nil	2 years of lower vocational school	nil
Period of part-time related instruction for young persons in apprenticeship	does not apply	compulsory day-release up to age 18 or till age of apprenticeship	voluntary day-release or evening classes ⁽⁴⁾ 2-3 years	voluntary day-release or evening classes ⁽⁵⁾ 3-4 years
Normal period of practical training in apprenticeship	does not apply	3-3.5 years	2-4 years ⁽⁶⁾	5 years

(1) Varies according to state (Land).

(2) The first year is mostly devoted to further general education and vocational orientation.

(3) Employment may begin at age 15 but an indenture cannot be concluded before the 16th birthday. The intervening time is often used as a period of orientation, basic training and probation and is sometimes counted as a part of the apprenticeship period by both employers and trainees. This explains why many employers and trainees in the United Kingdom sample account for more than 5 years of apprentice training. The indenture, as a general rule which allows for only a few exceptions, gives the 21st birthday as the day on which the apprentice and the employer are relieved of their respective obligations under the contract. As most contracts are signed on the 16th birthday, the full period of apprenticeship is normally five years. "Student" (secondary school leavers) and "Graduate" (university graduates, normally BSc) apprentices are given indentures for shorter periods.

(4) The Dordrecht metal trades industry initiated action, in 1955, leading to the establishment of a "Municipal Day School for Industry", which provides related instruction on a day-release basis (9 hours, 1 day per week) for industrial apprentices.

(5) Practices in the Bristol area differ between firms. The larger undertakings normally release their trainees for related instruction at a technical college for one day a week throughout the period of apprenticeship. Other undertakings permit day-release for the basic craft courses up to City and Guilds' Intermediate examination level, whereas further related instruction must be taken in the form of evening courses.

(6) Apprentices who have completed the lower technical school normally are indentured for a period of 2 years; the period of apprenticeship for those who completed their compulsory education in other streams is 3-4 years.

III. THE FINDINGS

1. Malines (Mechelen) in Belgium

Phase 1 - "Class '55"

The number of boys leaving the metal trades streams of the vocational schools(1) in the Malines area totalled 304 in 1955(2). Of these, 287 were located and replied to the questionnaire. Their median age was 27 years, and they had consequently, on an average, worked in industry for 8-9 years after finishing their training at school. They had, in addition, spent 18 months or more in compulsory military service. A minority had taken a final voluntary class of further training at a highly skilled level or had repeated one or two classes - 44 had had five years of training, 11 had passed their examinations at age 18 after six years at the vocational school.

The training given in both A3 and A4 schools covers a wide range of skills in the metal trades and includes fitting and machining, forging, sheet metal work and welding. The range and level of skill and knowledge acquired in the course of training may thus be described as that of a general mechanic. One line of specialisation leads to qualification as electrician.

-
- (1) In Belgium most skilled and semi-skilled workers acquire their qualifications by attending full-time technical or vocational schools. Training on the job in apprenticeship (prior to apprenticeship the youngsters attend full time primary school till age 14) is undertaken chiefly in the craft trades, commercial occupations and certain trades and occupations current mainly in small-scale industry. The Belgian system of vocational training and education (from age 12-13 on) distinguishes between two types of vocational school: the A4 school which gives basic, mainly practical training and the A3 school which devotes more time and attention to related instruction and further general education. Graduates of the A3 schools are considered to have received full training as skilled workers. The A4 school graduates are trained to a level which may be said to correspond to that of a semi-skilled or "angelernt" worker in other countries.

It would appear from the replies to questionnaires received from former trainees and employers that these distinctions are not always maintained in employment. Several among those who had graduated from A4 schools in the sample were undoubtedly performing work at a highly skilled level, while some A3 graduates were found to have settled down in semi-skilled or narrowly specialised jobs. Owing to the difficulties of drawing a clear line of distinction between these two levels, no attempt has been made to compare the present status of A3 and A4 graduates respectively.

- (2) The area covered includes five schools in four towns, namely, an A3 school in Kontich (pop. 10,000), a combined A3-A4 school in Vilvoorde (pop. 22,000), a combined A2-A3 school in Boom (pop. 18,000), a combined A2-A3-A4 school and a combined A1-A2-A3 school in Malines (Mechelen - pop. 65,000). A1 schools train higher technicians: A2 schools are for training at the technician level. These two levels correspond roughly to those of the HND and OND respectively in the United Kingdom and to the levels of Ingenieur and Techniker in the Federal Republic of Germany.

At the time of the inquiry the 287 graduates making up the sample worked in the following types and levels of occupation:

Group 1: 40 persons had reached a status above the level of the average skilled metal trades worker and were employed as setters, instructors, supervisors, draughtsmen or planning technicians, or had set up their own business.

Group 2: 27 were working as toolmakers and on other jobs which could safely be identified as skilled manual work within the metal trades.

Group 3: 199 workers were employed on semi-skilled or specialised jobs or were carrying out work, the level and scope of which could not be exactly determined.

Group 4: 21 persons, finally, had left the metal trades and taken up work in another field of activity (for convenience, hereafter called the "leavers").

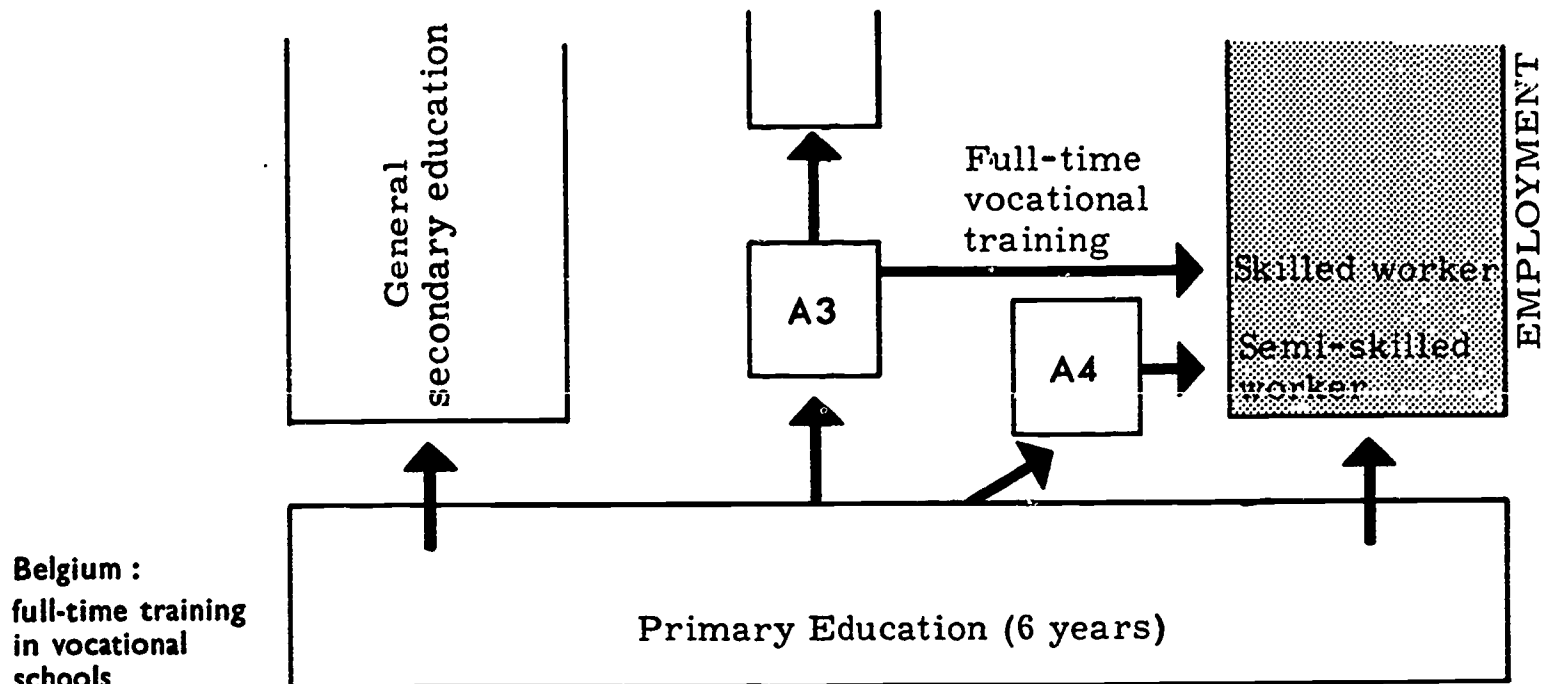
Those who had moved to posts involving supervisory or technical preparatory functions and those who were doing highly skilled work, had already distinguished themselves at school: on an average their marks were clearly superior to those obtained by their fellow trainees. The future supervisors and technicians attained the highest marks in the theoretical examinations, while the future toolmakers achieved high marks in the practical examinations.

Group	Total No.	Examination results		Mobility	Further training	
		Theory (high pass) %	Practice (high pass) %	Had changed employer %	Had taken courses %	Had passed examinations %
Instructors, super- visors, setters, etc.	40	40	42	85	65	53
Skilled	27	29	47	67	59	33
Specialised	199	19	32	71	42	17
"Leavers"	21	14	33	100	29	19

The young men whose marks were towards the lower end of the scale are the ones who have tended to leave the trade and go into other employment.

Statistically less significant differences between the four groups are found with regard to the number of times the workers had changed employer.

The pattern of mobility of the highly skilled craftsmen (group 2) does not significantly deviate from that of the specialised workers.



Those on the way up in their career (supervisors, etc.) are a more mobile group. Within this group it is the self-employed and the draughtsmen who have weighted the figures; if they were to be excluded, the average of groups 2 and 3 would become about the same.

Those who were finally to leave the industry changed employer frequently.

These preliminary analyses already tend to show a general pattern: a highly-skilled élite (groups 1 and 2), a substantial middle group (65 per cent) doing both skilled and semi-skilled work, and an uninterested lower group on its way out of the industry. An examination of the workers' efforts towards further training and obtaining qualifications at a higher level or in related crafts reinforces this pattern. The figures in the table relate only to courses of further training and to supplementary technical courses; induction training and adaptation courses during the early stages of employment - both of which play a considerable role in Belgium - have not been included.

Again groups 1 and 2 are significantly above the average: between them they obtained nearly half of the total number of examination passes. Group 4 - those who were later to leave the industry - had shown the least interest: their course attendance rate is considerably below average.

These observations are confirmed when the rate of success in the courses is taken into account. While the supervisors, draughtsmen, etc. (group 1) took 26 courses and passed 21 examinations, and the toolmakers (group 2) took 16 courses and passed 9 examinations - in both cases more than half - only 40 per cent of the courses attended by members of group 3 resulted in a pass in an examination. The figures for group 4 are too small to allow any conclusions to be drawn on this point.

Many of the courses attended by members of group 3 were relatively short and did not lead to an examination or official certificate of skill and knowledge. Members of groups 1 and 2, on the other hand, had usually gone to courses of further training or upgrading, or for broadening their technical skill and knowledge with the definite intention of obtaining supplementary, officially recognised qualifications.

Phase 2 - Skilled workers in 1963

In all, 317 replies were received from undertakings regarding the background and origin of their skilled workers. As in the first sample - the class of '55 - this total

contains a large group of persons (274) whose work level cannot be identified with any degree of certainty. At least 10 per cent, according to information given in the individual replies to the questionnaire, were doing narrowly specialised or unskilled work. The employers estimated this part of the sample at 50 per cent.

The sample included 32 tool- and die makers and other specialists clearly identifiable as skilled workers, and 11 assistant foremen. These two groups were isolated and compared with the rest.

Belgian industry does not, as is often assumed, rely entirely upon the schools for its supply of skilled workers. A relatively large proportion (30 per cent) of the total sample had in fact picked up their skills on the job or in artisan apprenticeship. (The material does not distinguish between these two types of on-the-job training.)

The number of school-trained craftsmen among the supervisors was relatively high; the toolmakers conformed to the general average. The groups are too small, however, for the differences to be statistically significant.

The toolmakers and the supervisors had clearly been more interested than the average worker in going to courses and acquiring additional recognised qualifications. As in Phase 1, induction and adaptation courses have not been included. It is more especially the toolmakers who have gone to courses for further training and have taken supplementary examinations. They constitute 20 per cent of all course participants, whereas the group itself makes up only 10 per cent of the total.

Group	Total No.	Place of training		Further training	
		At school %	On the job %	Had taken courses %	Had passed examinations %
Toolmakers	32	69	31	31	25
Supervisors	11	82	18	27	18
Skilled and specialised	274	72	28	14	14

Most of the supplementary training courses were taken by workers who had been trained on the job. Among the toolmakers, for instance, 6 of the 10 workers who were trained on the job and not at a vocational school had attended evening courses at a corresponding level. In the majority group also, most of the course participants were workers who had been trained on the job.

Training arrangements within undertakings

Only one firm - the smallest, employing 18 workers - had not made any formal arrangements for training its staff. In all other undertakings, some kind of training organisation existed, ranging from a part-time training officer in the smaller firms to a fully staffed and well-equipped training department in the larger ones (see table on page 15)

In most instances the training is directed towards qualified staff recruited from the schools and skilled workers with previous practical experience.

Induction and adaptation training take place mainly on the job and are the responsibility of the supervisors and middle management. Two trends show up clearly: one towards normalising the period of induction training and adaptation, the other towards partly replacing the supervisors by special instructors responsible for guiding new recruits.

No over-all training pattern - common to a majority of firms - seems to have developed as yet. In most firms, A3 and A4 school leavers pass through a breaking in and trial period of about three months after taking up their first employment. Two undertakings, both with high quality requirements, have stretched this period to 3 years (ages 16 to 19); another firm, manufacturing machine tools and having about the same level of quality requirements, is contemplating a radical change - a substantial prolongation of the initiation period and the transfer of some of the training to a special training centre. These three firms which are moving towards a longer and more thorough further training for their skilled workers, account for nearly half of the craftsmen covered in the inquiry.

TRAINING ARRANGEMENTS WITHIN UNDERTAKINGS

Under-taking	Total employed	Unskilled and specialised without practical experience	Training staff without practical experience	Skilled workers with practical experience	
A	10,000	-	6 weeks adaptation through instructors	Specialisation, varying duration	
B	8,767	2 years basic training through supervisors in training centre. Practice and theory	-	Specialisation) varying promotion) duration through management	
C	1,380	Basic and safety training through supervisors	Initiation and adaptation through supervisors	Specialisation through supervisors	Further training measures under consideration
D	1,320	-	Adaptation, 2-3 months through lower management	Specialisation	
E	800	Basic training of varying duration through supervisors	Adaptation, varying duration through supervisors	Specialisation) varying promotion) duration through foremen	
F	700	Basic training ± 2 years through immediate supervisor	Initiation and adaptation (maximum 3 years) through immediate supervisor	-	
G	613	Basic training, 1-12 months, through supervisors and instructors	Initiation and adaptation, 4 months through instructors	Specialisation through foremen	
H	400	-	-	Specialisation) 3 years promotion) through COFCE course	
I	390	-	Adaptation, 2 weeks through foremen	-	
J	228	-	Initiation and adaptation - 3 months, through immediate supervisors	Upgrading - 3 months through immediate supervisors	
K	145	Basic training, 3 months, through foremen	Adaptation, 3 mont' through supervisors	Specialisation) 2 years promotion) through foremen (upwards rotation)	Further training for skilled work through independent production of machine parts
L	134	-	Initiation and adaptation - 3 months, through foremen	-	Training skilled workers in new techniques (not taught at school); regular meetings for supervisory staff
M	110	Basic training, 4 years through foremen	Initiation and adaptation, 3 years, through foremen (job rotation)	Specialisation) 6 months promotion) through production manager	-
N	18	-	-	-	-

2. Karlsruhe in the Federal Republic of Germany

Apprenticeship is the accepted entry into skilled work not only in the metal trades but in all trades and occupations. It is also in most cases a prerequisite for technician and higher technical training.

The training of apprentices is regulated by officially recognised trade descriptions, training syllabi and examination requirements issued by the Ministry of Economic Affairs. The trades of fitter-machinist, toolmaker and general mechanic considered in this study are closely related, and the standard syllabi cover the whole range of manual and mechanical operations normally occurring in metal trades workshops. Compulsory related instruction includes technology, mathematics, geometry and mechanical drawing. All three trades require an apprenticeship period of three and a half years.

Phase 1 - "Class '58"

In 1958, a total of 118 persons passed their skilled worker examination (Facharbeiterprüfung) before the examining board of the Karlsruhe Chamber of Industry and Commerce in the crafts covered by the survey. There were:

- 76 fitter-machinists (Maschinenschlosser)
- 29 tool-and die makers (Werkzeugmacher)
- 13 general mechanics (Mechaniker)

The survey was able to follow up 51 of the 118 into their present employment, or 42.3 per cent.

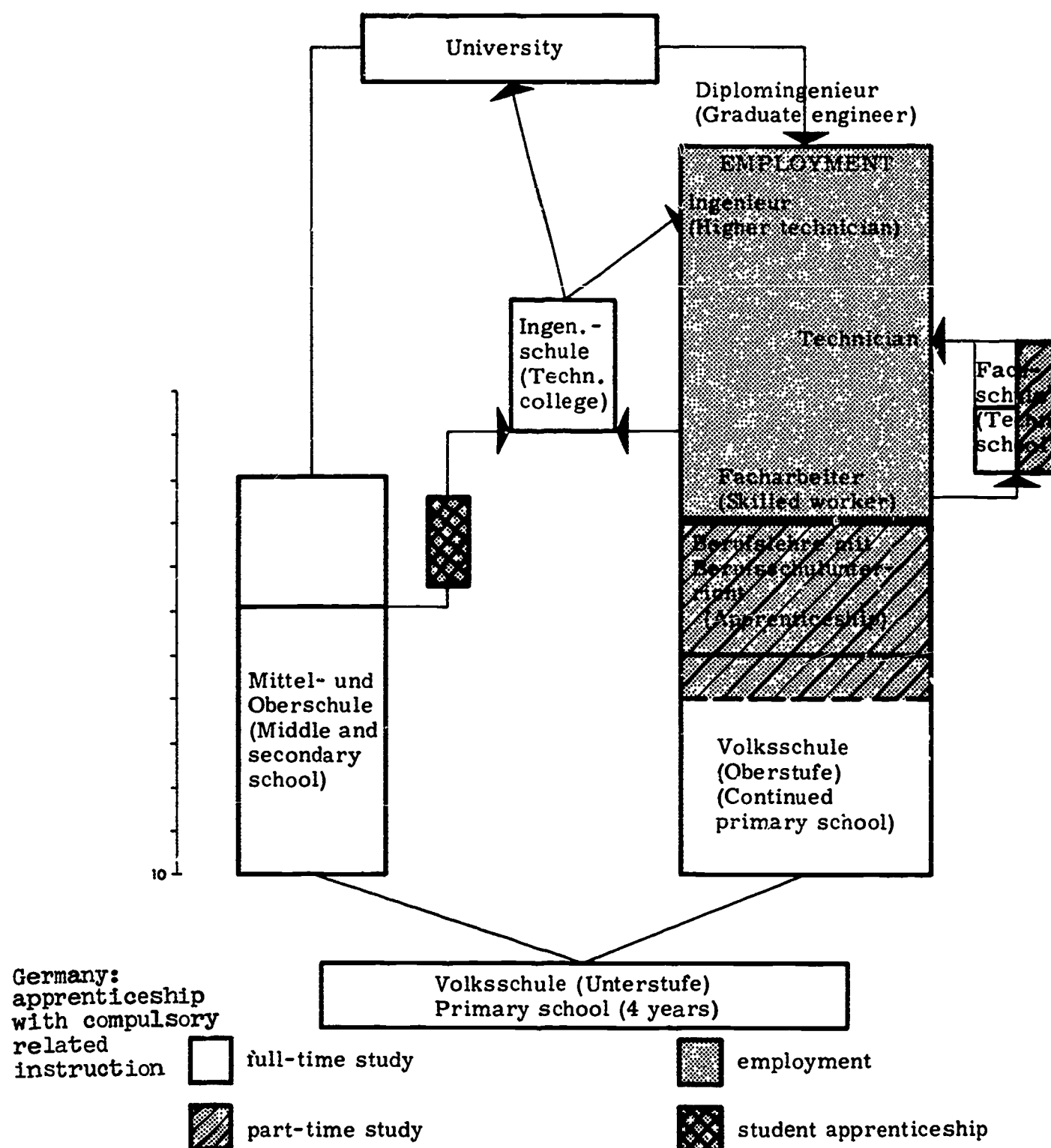
The median age of the group at the time of the investigation was 23 years (40 were 22 or 23 years old and 7 were 24). On an average they had 5 to 6 years of practical experience after having completed their apprenticeship at the age of 17 or 18.

Most of the 51 workers located (43) had gone into apprenticeship at the end of compulsory schooling (age 14); 8 had completed middle school. All had received their basic training in a company-owned vocational school (43) or in a training bay (8).

Regrouped under general occupational headings, the 51 workers who had replied by December 1963 included:

- 10 workers in production and assembly,
- 11 toolmakers, instrument mechanics, maintenance mechanics,
- 14 draughtsmen, design technicians and other technicians (including one man who had graduated as a higher technician),
- 12 students at technical colleges and other educational institutions (including one at a trade union school),
- 4 men on military service.

The group had a very high rate of mobility in employment. Only 14 had remained with their original employer; 14 had changed employment once, 16 twice; 7 had changed employment three times or more.



The general impression gained when studying the 51 replies received is that each worker tended to consider his apprenticeship period and his first employment as only one step in a career towards work at a level above that of the skilled worker.

As many as 29 of the 51 members of the sample (57 per cent) had already completed or were well advanced in their studies with a view to acquiring broader qualifications within their own trade(2), or to obtaining employment at the level of a technician (14) or a higher technician(13); 8 of them had already taken further training courses during their period of apprenticeship.

In view of the comparatively low average age and the time lost in military service (11 of the group had spent about a year in the armed forces), it is not surprising that few of them had already terminated the courses embarked on, which in most cases were of long-term character. One had acquired additional broader qualifications at the skilled worker level; 5 had successfully sat for an examination at the technician level and 2 had passed an examination at the higher technician level.

When discussing their plans for the future, 36 of the group (70 per cent) said that they hoped to continue their training and studies. The foreman-level courses and

examinations (Industriemeisterprüfung) were the objective for 11 of them; 5 planned to become draughtsmen or designers; 4 wished to qualify as technicians, and 13 as higher technicians. One was aiming at undertaking higher social studies; only 2 were considering training for the highly skilled worker level.

Phase 2 - Skilled workers in 1963

The second test group comprised 98 persons. In addition, information was supplied about the background and career of 32 assistant foremen and foremen, technicians and higher technicians who were now working in the ten plants covered by survey and had started their career in apprenticeship. The median age of the group was 25, with a relatively even distribution between the ages of 23 and 28.

From the job descriptions supplied, it was possible to identify 54 of the workers as carrying out work at a highly skilled level. This sub-group comprised: 10 toolmakers, 9 repair mechanics, 10 machine setters, 21 machine assembly mechanics working on short production runs, 1 instructor and 3 customer-service mechanics.

The remaining 44 members of the group were carrying out work of a semi-skilled or specialised nature.

These two sub-groups were compared. All the workers had received training as apprentices in one of the metal trades. The two largest trade groups were made up of the persons who had been trained as fitter-machinist(62) or as toolmaker(18); in all, 9 crafts were represented in the sample. The only workers who had been trained outside the mechanical engineering industry were 6 mechanics trained in the building trades.

The marks obtained in the final apprenticeship examination seem to have forecast with a certain degree of accuracy the future of the individual members of the sample. Among those working in 1963 at the highly skilled level, more than two thirds(38) had achieved high marks in the practical examinations, and close to 50 per cent (25 out of 54) had received high marks in the theoretical examination.

Group	Total No.	Education More than compul- sory %	Place of training	Examination results		Mobility Had changed employer %	Further training	
			Fully on shop floor %	Theory (high pass) %	Practice (high pass) %		Courses taken No.	Examina- tion passes No.
Promoted	33	18	0	68	76	79	35	17
Highly skilled	54	1	4	46	69	46	12	3
Skilled and specialised	44	0	30	34	39	61	8	0

In contrast, 29 members of the second sub-group (group total: 44) had just scraped through the practical examinations and 32 barely passed the theoretical examination.

Only 46 per cent of the highly skilled had changed employer whereas the comparable figure for the semi-skilled and specialised group was 61 per cent. A curious detail would seem to be the very high rate of turnover among the setters: 1 had changed employer once and 1 twice; 5 had changed at least 4 times; only 3 had remained with their first employer [see table (a) page 19].

In both sub-groups of Phase 2 the number of persons following courses was low: 2 were attending foreman training (evening) courses, 5 were taking further training within their own trade, 6 were taking technician-level courses, and 7 were taking courses of further general education. Course attendance was fairly evenly divided between the two groups (12 for the highly skilled and 8 for the specialised).

Only three of the members of the Phase 2 sample had passed any examination after the end of their apprenticeship. Two had acquired the industrial foreman certificate and two had qualified as time and motion study technicians (R.E.F.A.).

Although course attendance was low for both sub-groups, there were pronounced differences as regards expectations for a future change in occupations. Among the highly skilled, 50 per cent - 27 out of 54 - hoped to become foreman or technician; 5 wanted to take further training in their own trade. In other words, about 60 per cent of this sub-group expected to climb further up the hierarchical ladder within the industry.

In contrast, only 40 per cent of the semi-skilled or specialised workers nursed any marked aspirations for the future: 12 hoped to become foremen (7 of the 12 were doing inspection work), 2 planned to become technicians (5 were already studying for an examination at the technician level), and 3 hoped to gain further promotion within their own trade.

(a) Highly skilled:

Occupation	Same employer	Changed employer			
		once	twice	three times	four times or more
Instructor	-	-	1	-	-
Setter	3	1	1	-	5
Toolmaker	6	1	2	-	1
Machine assembly	16	1	3	2	2
Repair	4	4	-	-	1
Total	29	7	7	2	9

(b) Others:

Occupation	Same employer	Changed employer			
		once	twice	three times	four times or more
Welders	2	3	-	1	-
Machine workers	3	1	3	1	-
Parts assembly	10	6	3	2	1
Inspectors	2	2	3	1	-
Total	17	12	9	5	1

Skilled workers who had gained promotion

The firms employing the 98 skilled workers making up the groups of the Phase 2 sample, also supplied information on 33 employees who had started their career as apprentices and had since been promoted to assistant foreman, foreman, technician or higher technician rank.

The median age (27 years) of the promoted group was higher than the median ages of the other two groups: 13 were below the age of 27; 7 were in the median age of the group, and 13 were 28 or over.

In comparing the educational background and achievements of all three sub-groups, the over-all superiority of the promoted workers at the time of the skilled worker examination is obvious.

They had already had a better start in their general education record: 6 of the 33 had gone to middle-school level, whereas in the other two groups combined (total 98) only one had completed middle school. In the final apprenticeship examination only 33 per cent of the promoted group got a low pass mark in the theoretical subjects, compared with slightly more than 50 per cent of the highly skilled sub-group, and 66 per cent of the semi-skilled or specialised workers.

Between them the workers who had been promoted had taken 35 courses in various technical subjects or with a view to passing an examination at technician or at foreman level. Three had obtained the officially recognised higher technician certificate. Of the remainder, 10 had passed technician level examinations and 4 had obtained the industrial foreman certificate.

Training arrangements within undertakings

Of the ten firms included in the sample, six had their own school or training bay for providing first-year basic training. The number of persons employed by these firms varied from 320 to 2,250 workers. The four other undertakings (each employing between 50 and 460 workers) had made no special arrangements for training their apprentices.

Of the 54 highly skilled workers, only 2 had received their full training on the job. All the others had gone for at least one year to company-owned vocational schools or had received a considerable part of their training in a training bay or workshop outside regular production.

Taking the group of specialised workers, 13 out of 44 had acquired all their skilled worker training on the shop floor; 14 of the remaining 31 had received part of their training in training bays, and 17 had gone to company-owned schools.

Among the promoted group, 9 had been trained partly in training bays and 24 had gone to a company-owned school. Not one had received his training entirely on the job in production or in maintenance.

3. Dordrecht in the Netherlands

The Netherlands training system provides for basic training to be given in a vocational or junior technical school (lagere technische school - LTS). The duration of this training is usually 3 years: it begins at the age of 12 with a year of further education and vocational orientation followed by, in most cases, 2 years of basic training. Training in the metal trades stream is broad and includes basic operations in fitting, machining, forging and sheet-metal work.

This school-based training is followed by a 2-year period of apprenticeship in an undertaking. In Dordrecht - the locality selected for this study - as a result of action taken by the metal trades industry itself, a "Municipal Day School for Industry" was established in 1955 to provide related instruction on a day-release basis (9 hours, 1 day per week) for industrial apprentices.

Phase 1 - "Class '58"

The number of boys graduating from the Dordrecht Municipal Day School for Industry in 1958 was 89(1). The total number of persons for whom data are available is 61, or about two thirds of the original class.

The median age of this group was 24. All had had three years of basic training at the vocational school (LTS) and two years of training, under an apprenticeship contract, in industry.

The sample included, in addition to the usual metal trades craftsmen, three electricians and two highly skilled shipyard carpenters/joiners.

The distribution between the different levels and types of work of the 61 who completed their school training in 1958 had developed as follows by November 1963:

- 10 draughtsmen and other technical office staff;
- 14 toolmakers and other highly skilled workers;
- 26 fitters, turners, sheet-metal workers, welders and milling and drilling machine operators for whom the real level of work could not be determined with any great precision;
- 11 persons in various undertakings outside the metal trades (the "leavers").

These four groups were compared.

None of the "Class '58" graduates had been promoted to supervisory level.

For three of the groups - the draughtsmen, the tool- and die makers and those who left the industry - there is no significant difference between the performance in the school theoretical examination. In all three, the workers were about equally divided between the two levels of mark (high, low) given at the school. This placed them considerably above the average for the group as a whole.

(1) The inquiry in the Netherlands was carried out in the towns of Dordrecht (population 86,000), Zwiijndrecht (population 26,000) and Papendrecht (population 12,000).

As indicated in the table on page 9, the Dutch training system provides for basic training in a lower (or junior) technical school (lagere technische school - LTS). There is one such school in Dordrecht servicing all three towns. The duration of training is three years; it begins at the age of 12 with a year of further education and vocational orientation followed by two years of basic training in the metal trades or in woodworking. Training in the metal trades stream is broad and includes basic operations in fitting, machining, forging and sheet-metal work.

The Dordrecht Municipal Day School for Industry was described in footnote 4 on page 10 above.

Group	Total No.	Examination results		Mobility	Further training		
		General (high pass) %	Technical (high pass) %	Had changed employer %	Had taken courses		Examination passes No.
					General %	Technical %	
Draughtsmen	10	50	50	40	20	70	0
Toolmakers	14	50	50	63	14	64	3
Specialised	26	27	73	23	50	12	1
"Leavers"	11	55	45	100	27	45	0

Except for the workers who left the metal trades altogether (most of whom had changed employer only once), only the toolmakers seem to have changed employer more frequently than the rest.

The difference between the draughtsmen and the rest of the group might appear statistically significant. The group is so small, however, that an over-all impression of general stability in employment must be considered the only really safe conclusion to draw.

Interest in further education and training was high. Of the whole group, 44 members (72 per cent) had taken, or were attending, a total of 52 courses.

The frequency of course participation was highest among the draughtsmen: 9 out of 10 had attended one or more courses. It was also relatively high among the toolmakers, but much lower among those who had left the metal trades and among the larger group of 26 more narrowly specialised workers.

A significant difference can be observed in the type of course attended by the members of the different groups. The draughtsmen and the toolmakers generally went in for technical courses; the specialised workers had usually gone in for courses of further general education.

Only 4 of the 44 course participants had taken any examinations on completing their courses.

Phase 2 - Skilled workers in 1963

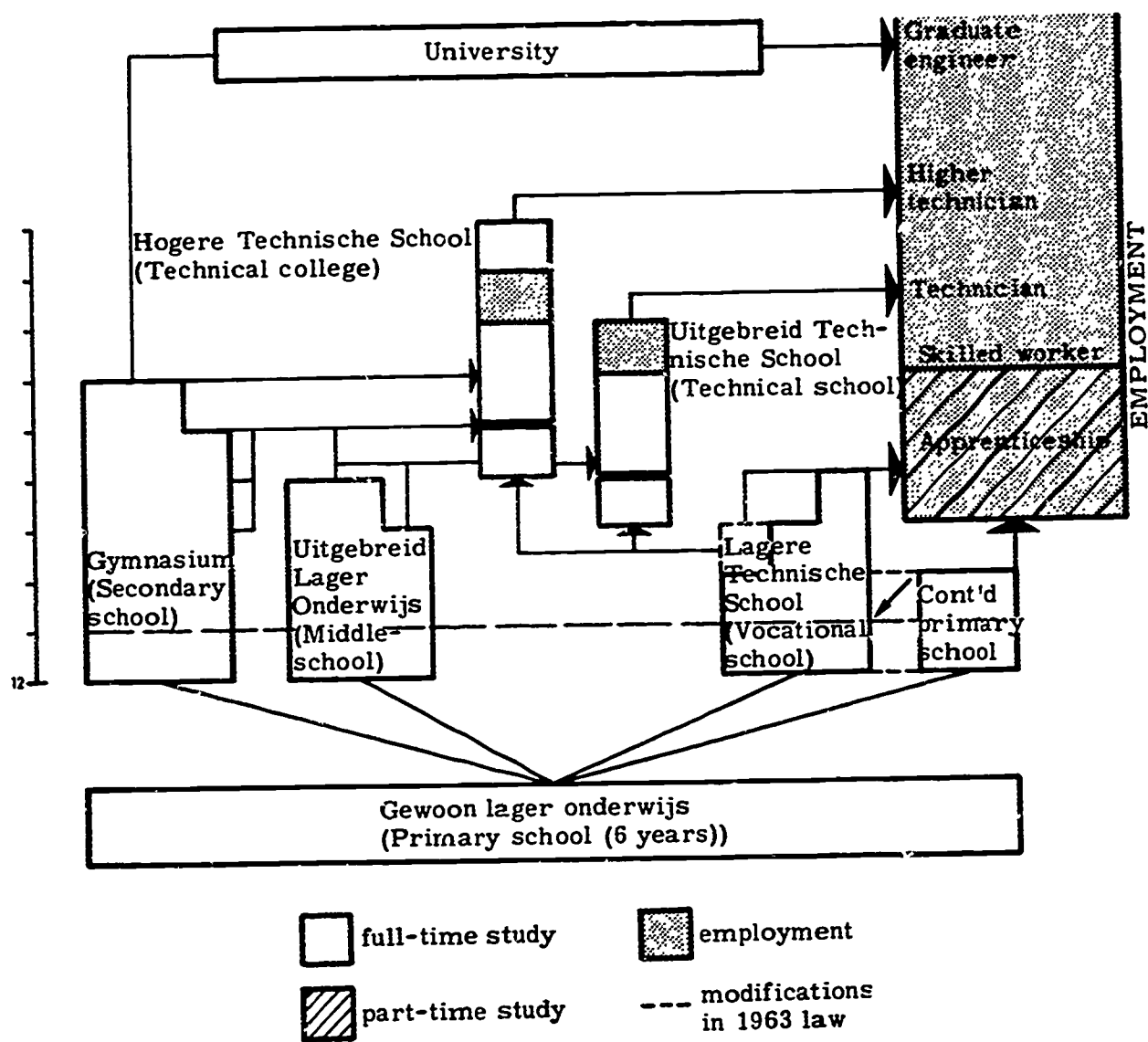
A total of 105 replies were received from ten undertakings concerning the background and origin of their skilled workers. The median age of the sample was 24; the distribution was fairly even over the age groups 22 to 26.

The Dutch wage system classifies skilled and highly skilled workers in wage groups IV, V and VI. A worker does not normally reach wage group VI until he is some years older than were the persons included in the Dordrecht sample, all of whom belonged to wage groups IV and V.

The proportion of skilled and highly skilled workers varies considerably from one undertaking to another. In one firm only 7.6 per cent of its workers were classed in wage groups IV to VI; the highest proportion noted was 83 per cent - in the smallest firm. In the course of the interviews, both the employers and the workers indicated the proportion of specialised workers and skilled workers in the group as being about equal.

Thirty-one workers could be clearly indentified at the level of highly skilled workers. This group was separated from and compared with the remaining group of 74.

More than 60 per cent of the workers had received their training in an LTS followed by apprenticeship. Surprisingly, however, a high proportion of workers had attained skilled worker recognition without, or with incomplete formal training. Among them there were some who had only completed the vocational or junior technical school course and had had no formal apprenticeship, and others who had picked up their skills and knowledge mostly by training on the job.



Persons who have completed both LTS and apprenticeship would seem to have a far better chance than the others of entering the highly skilled category. Seventy-seven per cent of the highly skilled had benefited from such combined training at school and in apprenticeship; only 55 per cent of the skilled and specialised workers had had the advantage of such comprehensive training.

A total of 60 persons had gone to, or were currently attending courses. The majority of these courses (45 out of a total of 76) were special courses within the trade or for broadening trade knowledge.

Group	Total No.	Basic and craft training				Further training
		Combined LTS and apprentice- ship %	LTS only %	Apprentice- ship only %	Other %	Had taken courses %
Highly skilled	31	78	13	3	7	55
Skilled and specialised	74	56	24	0	21	58

Twelve workers had taken, or were going to a course of further general education preparatory to training as a vocational teacher. Three were taking special vocational training courses, and 16 were taking further technical/theoretical training.

There is no significant difference between the two groups with regard to the frequency of their attending courses - 55 per cent of the highly skilled and 58 per cent of the others. It is generally held that young workers who regularly and assiduously take school or correspondence courses in subjects not directly related to the industry or occupation in which they are employed, tend to consider their employment as workers valuable but temporary experience, and plan to move on to another type of work. Only one of the respondents included any mention of having passed an examination.

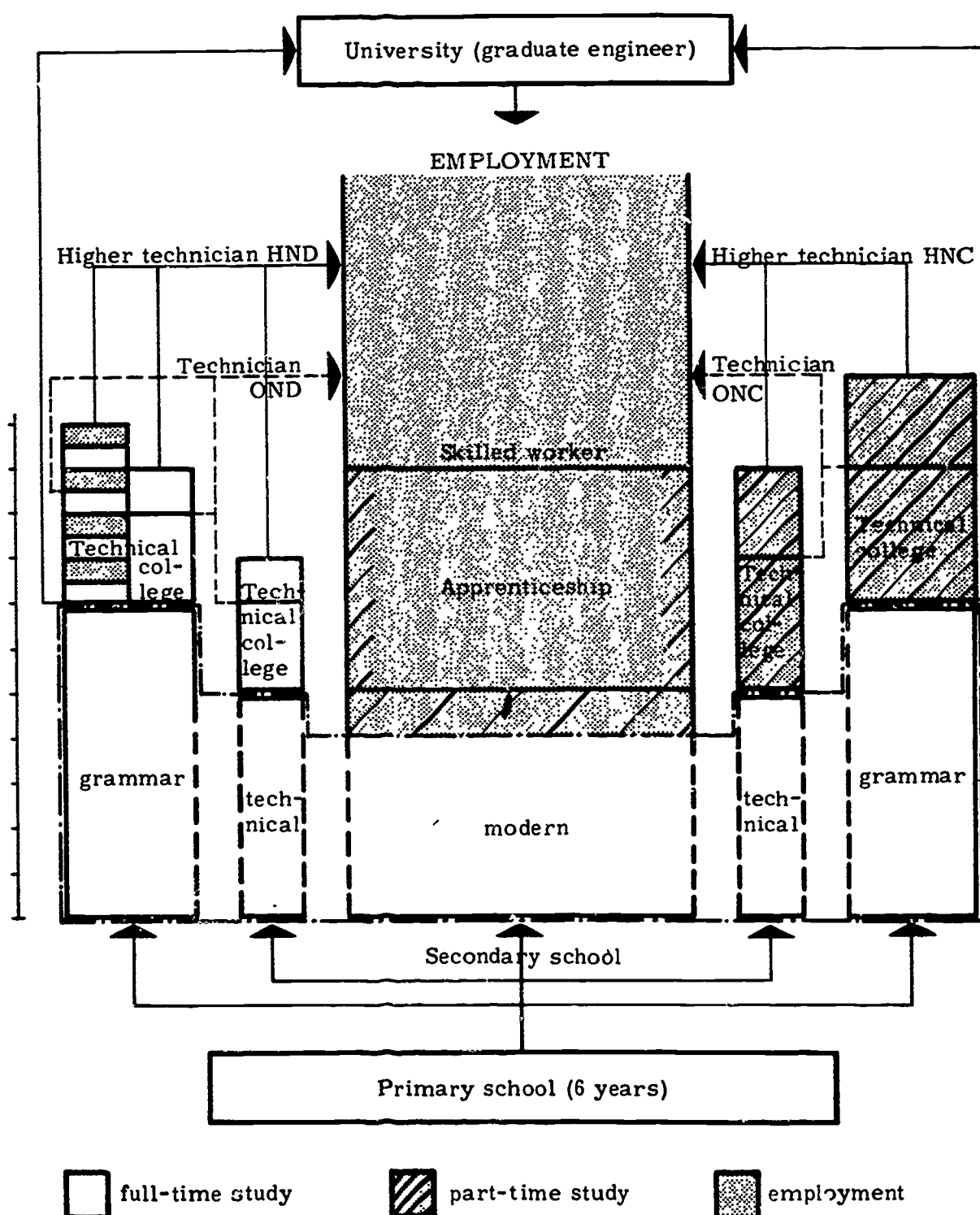
Training arrangements within undertakings

The smallness of the firms (the employee pay-rolls ranged in size from 41 to 650 workers, with a median employment of 238) and the relatively low proportion of skilled workers in their employment, had led managements to rely mainly on training on the job under the department supervisor. The larger firms had engaged a supervisor/instructor for supervising the systematic rotation and progress of their trainees.

4. Bristol in the United Kingdom

The normal route to skilled worker qualifications in the United Kingdom is through training under a contract of apprenticeship. The apprenticeship contract or indenture may not be concluded before the trainee has reached the age of 16; as a general rule, it gives the 21st birthday as the day on which the apprentice and the employer are relieved of their respective obligations. Since employment may begin at the age of 15, the intervening time between the 15th and the 16th birthdays is often used as a period of orientation, basic training and probation and is sometimes counted by both employer and trainee as part of the apprenticeship period.

Related instruction for apprentices and skilled workers is provided by technical schools and colleges through a variety of full-time and part-time craft courses which prepare their students and trainees for different levels of examinations set by the City and Guilds of London Institute. In machine shop engineering the Institute organises two levels of examination: intermediate and final. Students who have passed the final certificate examination may continue studies with a view to obtaining the City and Guilds full Technological Certificate (technician level). They may also opt for courses leading to the technician level Ordinary and Higher National Certificates (ONC and HNC).



United Kingdom:
apprenticeship
and optional
technical
education.
The chart refers
to education in
England
and Wales

Selecting the sample

As a result of the procedure applied in selecting the sample, the Bristol study is the one which differs the most radically from the norm. The basic selection was made in the plants and included only those skilled workers who had completed their first craft level courses in 1958. Consequently the whole sample has been analysed in a single operation.

Over 200 replies to the questionnaire were received from young skilled workers, the technical colleges in the area and eight industrial undertakings. Among these, 148 were selected to form a group which would be representative of both area and industry and which, at the same time, would be detailed enough to permit an analysis.

The relatively high age (21) at which apprenticeship is terminated in the United Kingdom and the desirability, for reasons already explained, to restrict the enquiry to a relatively low age (median age in the sample 23) made it necessary for the research workers at Bristol to restrict the survey to workers who had remained with the employers in whose plants they had served their apprenticeship. The sample does also include, however, engineers, supervisors and draughtsmen who terminated their apprenticeship in the years 1961-1962 and who, in most cases, completed their first craft courses at a technical college in 1958.

At the time of the enquiry the occupational distribution of the 148 former apprentices selected had become the following:

- 17 staff rank supervisors or technicians (included in this group are two setters who appeared to have certain supervisory duties or to be mainly undergoing training with a view to promotion into supervisory or engineering grades);
- 9 draughtsmen;
- 14 inspectors;
- 24 toolmakers;
- 34 machinists;
- 10 mechanics;
- 40 fitters.

The absence of standard syllabi of practical training, which is a characteristic of the United Kingdom system of apprentice training, makes it impossible to separate these according to primary specialisation. The course of training varies greatly between firms and even between apprentices in the same general stream within firms. Some, who are qualifying for higher level jobs, may still be in training several years after the end of their apprenticeship.

This absence of structure in the system also makes it difficult to suggest points of comparison with the findings in the other countries. In the summary description of the United Kingdom system in the introduction to this report (cf. page 1) attention was drawn to the close correlation between the training of skilled workers and that of technicians, engineers and other higher technical staff. To this observation should be added another: that concepts regarding the scope and purpose of apprentice training in the United Kingdom vary also between undertakings within the metal trades. One of the largest firms included in the survey had trained practically only fitters, toolmakers and machinists. Only two out of 30 apprentices reported on by this firm had obtained qualifications

at a higher level than the City and Guilds final craft course examinations. These two had continued their studies in evening courses leading to the full technical certificate.

Each of the seven occupational fields or levels mentioned above is treated as a separate group within the sample.

The table indicates the number in each group which had entered and persevered in the part-time City and Guilds craft courses or the technician courses, and the examination levels reached.

Group	Level of technical education					Examination results	
	Total No.	Craft courses		Technician courses		High pass	No examination taken
		First level	Final	First level	Higher		
Staff rank, and supervisors	17	2	4	7	2	5	2
Draughtsmen	9	4	1	3	1	3	-
Inspectors	14	3	6	2	-	7	3
Toolmakers	24	8	10	3	2	10	1
Fitters	40	11	15	2	-	9	9
Machinists	34	14	15	1	-	9	4
Mechanics	10	4	4	-	-	4	2

One of the largest firms included in the survey had almost exclusively trained fitters, toolmakers and machinists. Out of 30 apprentices reported on by this firm, only two had obtained qualifications at a level higher than the City and Guilds final craft course examinations. These two had continued their studies in evening courses leading to the full Technological Certificate.

In contrast, another undertaking, reporting on 87 apprentices trained since 1947, indicated that 74 of them had become highly skilled workers and professional staff: draughtsmen (10), engineers and supervisors (30), toolmakers (18), electrician/mechanics (13) and setters (3). By 1963 only 13 of its former apprentices were employed at, or below, what might be called the ordinary skilled worker level.

Training assignments

The difference in concept between the undertakings is particularly apparent with regard to the programme followed in training for trades such as fitting and machining. In some undertakings, except for a basic training period varying in duration from 1 to 6 months, craftsmen belonging to these two trades are trained entirely in the production shops where they often do highly specialised work for long periods of time during their apprenticeship. The records supplied by these firms as well as by their trainees, show that the period of training was relatively short and that the apprentices were carrying out full-scale production work for a fairly long stretch of time within the span of their apprenticeship. Other undertakings, however, arranged for their apprentices to move systematically from one operation to another during a period which might last from one to three years, and which constituted a period of "formative" training immediately following the first 6 or 12 months of basic training and preceding specialisation.

Training assignment	17 Staff rank and supervisors				24 Toolmakers				40 Fitters				34 Machinists			
	No. of assignments reported	No. of months		No. of assignments reported	No. of assignments reported	No. of months		No. of assignments reported	No. of assignments reported	No. of months		No. of assignments reported	No. of assignments reported	No. of months		No. of assignments reported
		Min.	Max.			Min.	Max.			Min.	Max.			Min.	Max.	
Basic manual	11	3	26	21	3	24	38	1	30	1	30	30	1	18		
Machine shop	16	1	51	23	2	34	19	1	44	1	44	33	10	60		
Fitting	14	3	42	21	5	34	39	5	60	5	60	9	1	15		
Tool room	2	2	8	11	12	60	2	24	29	24	29	1		10		
Research and development laboratory	4	5	17	5	6	16	8	3	26	3	26	-	-	-		
Inspection	7	1	41	8	3	12	13	1	11	1	11	6	2	6		
Other manual	6	4	36	9	1	25	9	3	26	3	26	1		4		
Instructing	2	2	3	-	-	-	-	-	-	-	-	-	-	-		
Planning, estimating	3	2	14	-	-	-	4	10	16	10	16	2	3	8		
Drawing	11	1	26	11	1	12	8	1	10	1	10	1		9		
Supervision	3	2	14	-	-	-	1		2		2	1		24		
Total training period		38	72		53	72		30	72		72		34	60		

With one exception - the machinists - the maximum training period has extended beyond the standard 5 year period. For none of the groups had one single training assignment been common to all members. The tendency is to redress these irregularities after apprenticeship. Four of the 9 draughtsmen had spent periods of 2 to 24 months in work outside the drawing office, periods which were clearly designed to broaden their experience and give them a better basis for work as draughtsmen and designers. This practice was also noted in a number of the case histories of the engineers, supervisors and technicians: several assignments after the end of apprenticeship had been given specifically with a view to providing further training.

The tendency was less apparent in the case of the fitters, mechanics, toolmakers and machinists. Only a few of them - in practically all cases young workers who were pursuing further studies at technical college, or who had already obtained recognised qualifications above the City and Guilds Final Certificate level - had been assigned to jobs outside their own field of specialisation after completing their apprenticeship.

The group of inspectors constitutes a special case in this sample since the inspectors appear to be at a higher level than the similar groups in the three other countries studied. This difference may be merely a question of job title; it may also result, at least in part, from the fact that the aircraft industry, which is the predominant industry in the area, needs highly qualified inspectors for testing and control purposes.

Very few of the young skilled workers in Bristol replied negatively when asked to what extent the various job assignments during their training had been of use to them in their later work. The fact that the replies to the questionnaire were being returned through the employer may have been a sufficient deterrent to several of the young craftsmen and skilled workers who might have been reluctant to submit, through management, observations which could have been interpreted as a criticism of the training programme.

As a group, the most critical replies came from the draughtsmen: 5 of them - more than half - indicated that they had spent several months on jobs which had been of no value from a training point of view. Negative comments from 10 of the 24 toolmakers concerned assignments on which they may have spent from one month to as much as 21 months. In all the other cases, only a small minority suggested that part of their training time had been wasted in one way or another.

Training arrangements within undertakings

All but one of the eight Bristol undertakings participating in the survey had a special training section in which all (or, in one firm, a majority of) their apprentices received basic training for a period varying in duration from 5 to 24 months. In accordance with the practice adopted in an increasing number of plants in the United Kingdom, this basic training is followed by a period of "formative" training during which the apprentices are successively assigned to several departments, mainly for the purpose of widening their experience by practising a number of different operations. Training with a view to specialisation - in most cases lasting from 6 to 36 months - ends the apprenticeship.

Most of the undertakings reported that they were contemplating changes in their present training arrangements. Some of them were actively conducting a full-scale review or investigation of their training programmes and were drawing up radically reformed or rationalised programmes, but not all the changes proposed were following the same lines. The duration of training was commonly under fire: one firm wanted to reduce the currently

recognised minimum training period - despite union opposition - and another planned to prolong the formative training period. Such proposals generally implied an elimination of unnecessary training assignments and at the same time a more systematic rotation of the trainees from one job to another to round off their experience. One of the firms was introducing a 2-year sandwich course for basic training; another had instituted a special 4th year course to give more advanced training to its toolmakers.

All the innovations proposed and the comments show clearly the new emphasis being given to related instruction. A less marked but nevertheless present trend was a start towards adapting the apprentice training system to employee groups hitherto not included, e.g. the sales departments.

IV. ELEMENTS FOR COMPARISON

The basic hypothesis of this project stated five points on which it was hoped to arrive at some measure of international comparison:

- (1) the efficiency of different systems of training;
- (2) the effectiveness of training, expressed in terms of the degree to which the training given fosters intellectual interest and job satisfaction;
- (3) the motivation of employers for devoting time, effort and money to carrying out training programmes;
- (4) trends in the development of private training action;
- (5) national concepts of the qualifications, including experience, expected of the skilled worker.

It is obvious that no final conclusions regarding national vocational training systems can be drawn on the basis of a statistical investigation which only takes in data from one town in each country and from a single, relatively small - though essential - group of trades.

Nevertheless, it would seem that some of the data brought together under this research project can be used to reinforce - in some cases to query - several of the criticisms levelled and the proposals for improvements voiced in the extremely lively discussion going on in most countries today about the future organisation, form and content of vocational training.

1. The efficiency of the different systems

If it is assumed - an assumption which may be debatable - that the primary purpose of the training systems dealt with in the project is to produce skilled workers who will continue working for the industry for a long period of time, after having officially acquired skilled worker recognition, then their efficiency in producing the desired results may undoubtedly be considered questionable.

In all four countries it seems clear from the data collected that a very high proportion of those trained as skilled workers end up in a different type of job only a few years after completing their training. In this connection it should be remembered that the German and Dutch samples included only 53 and 68 per cent respectively of the total class of 1958. There is probably a higher drop-out rate among those who were not reached.

"Leaving the trade" takes place in three ways: by further studies and promotion, by moving into other trades and industries and by settling for a more limited job than the one for which the training was intended.

Taking all this into account, a skilled worker yield of between 20 and 50 per cent is probably a realistic estimate for any one of the four national training schemes.

Many of the broadly and highly skilled craftsmen contacted hoped to get on in their career to higher levels in the industrial hierarchy, or else to leave the industry entirely. The following table gives the frequency of course attendance among the highly skilled workers in the Belgian, German and Dutch samples. In the United Kingdom sample the skilled workers had terminated their apprenticeship too recently for data on their individual action to acquire further training and promotion to suggest any significant trends.

Sample	Attending courses in 1963		Had passed examinations		Persons studied	Median age
	No.	%	No.	%	No.	
Belgium						
- toolmakers } phase 1	16	59	9	33	27	27
phase 2 }	10	31	8	25	32	26
Germany						
- highly skilled	12	22	2	4	54	25
Netherlands						
- toolmakers } phase 1	11	78	3	21	14	24
phase 2 }	17	55	not known		31	24

The impression of the skilled workers on the upward move, either within the industry or going out of it altogether, is even further reinforced if the career dreams of the highly skilled workers are taken into account. As shown by the Phase 2 sample in Germany, many of their dreams never come true: the high drop-out rate in adult training courses is a phenomenon common to all countries. Still, many of the more highly skilled workers will undoubtedly have left the trade before they reach the age of 30.

At least in some countries the skilled worker group is replenished later on by a movement upgrading workers trained outside the regular vocational training system. In Belgium and the Netherlands some 30 per cent of the workers in the skilled categories did not have complete training according to the standard pattern of the country.

One of the reasons for the relatively high leaving rate may be that the system as such does not always provide the right skills. This was clearly demonstrated in the Belgian sample: Belgian school leavers are considered to have had complete training - yet many employers arrange systematic training during the first years of employment to supplement, "correct" or bring into line what has already been taught.

Such supplementary training measures occur frequently in the case of the apprenticeship systems, even when the training period is long. In several cases included in the United Kingdom sample the employer had clearly decided only after the end of apprenticeship to supplement the experience acquired by the trainee. Several draughtsmen, for instance, had spent only a few months in the drawing office during their apprenticeship -

one of them had never been in it at all; their training during apprenticeship had been entirely in the workshops and mostly on production work. Real training as a draughtsman had begun only in the two years following the end of apprenticeship.

2. Apprenticeship as an educational activity

It has already been suggested that young skilled workers in Germany tend to consider the apprenticeship period and their first employment as only one step in a career towards work levels above those of the skilled worker. The data on the further educational activities of the skilled workers surveyed, and particularly those of the highly skilled workers, would seem to suggest that many youngsters who left school at the age of 14 or 15 to go into apprenticeship, or who transferred at the age of 12 into the predominantly vocational streams within the general school system, develop a new interest in educational pursuits during their first period of work and training in industry.

It should not be forgotten, however, that reference has been made mainly to an elite group. German industrial undertakings, in selecting their apprentices, are in most cases systematically guiding the most competent recruits towards the three crafts included in the study. The figures quoted in the previous passage relate only to toolmakers and other highly skilled workers - again a group which may be expected to be superior to the others with regard to their intellectual and technical aptitude and ability. A study of the intellectual activities of the other workers, and their attitudes towards the day-release periods of related instruction and further education, would probably throw a different light on the educational defects of apprenticeship as it is now in most instances organised. Questions might also be asked regarding the general desirability of directing a large proportion of young persons into prevocational and vocational streams at the age of 12, that is, long before there is any possibility of determining with any degree of certainty the aptitudes and the suitability of the individual for work at the skilled craftsman level. It is therefore clear that the data collected under this present project do not permit any conclusions to be drawn with regard to the degree to which the training given has fostered intellectual interest, a desire for promotion and job satisfaction among the trainees and young workers. For such persons, broader and more intensive investigations would be required.

3. Motivation of employers

As indicated in Chapter III the systems of training applying in all four countries either pre-suppose that the employer will spend considerable effort and money on carrying out the training programmes for his workers, or, in fact, require him to do so. The general trend is clear: employers, particularly the large and middle-sized undertakings in all four countries, have taken steps over the past few years to improve the organisation of training within their undertaking. Obviously this will result in increased training costs.

The reasons why the undertakings are willing to take upon themselves such additional costs are well known: the skilled workers, supervisors and technicians, who are the principal "product" of these investments in training, constitute the key factors to the efficiency of the firm.

Staff in these skilled categories are in short supply. There is also the general trend that the proportion of highly skilled workers and technical staff is increasing in most plants in the metal trades.

The data gathered on the mobility of the skilled workers, on the other hand, showing the comparatively high "wastage" in the training systems investigated, would seem to act as deterrents:

Sample		Remained with first employer		Changed once or twice		Changed three times or more		Whole group
		No.	%	No.	%	No.	%	
Belgium	1	74	26.0	155	54.0	54	18.0	283
Germany	1	14	28.0	30	59.0	7	13.0	51
	2	46	47.0	35	36.0	17	17.0	98
Netherlands	1	31	51.0	29	48.0	1	1.0	61

Data collected under other research projects and found in current technical literature would seem to indicate that the cost of training skilled workers and technicians is rising rapidly. Questions relating to costs of training are being given constantly and rapidly increasing attention in the specialised journals dealing with vocational and technical education and training.

In some trades and occupations the employer may still "break even" between, on the one hand, his expenses for training and, on the other, the profit margin of the value of production and other work done by trainees over the relatively low apprentice wages. The cost of training for some of the fast expanding repair and maintenance trades (instrument mechanic, electronics mechanic and electrician) is going up rapidly. There is obviously a limit at which an employer will hesitate between making further investments in training and taking the risk of relying upon recruitment from outside.

The fears implied in the above statements are by no means supported by the observations made within the framework of the present project. Employers in all four countries, and particularly those in the larger and middle-sized undertakings, had, as already indicated, taken action to streamline, develop and improve - in many cases also to prolong - the training of their future skilled workers.

4. A clear plan of training

The most common trend in the two apprenticeship countries (Germany and the United Kingdom) was towards the establishment of company-owned vocational schools providing a period of basic training lasting from 6 to 18 months. Seen from the point of view of international comparison, this constitutes a move towards harmonisation of training methods: the undertakings in the two apprenticeship countries are organising for the type of initial training provided by the school-based systems in Belgium and the Netherlands.

Basic training was almost invariably being carried out in special training sections or in company-owned schools. Organisationally as well as physically it was kept separate from production. In several of the companies, trainees remained throughout the training period under the supervision of a special training department. Work assignments were determined on the basis of a fixed training schedule. Several companies indicated

that the training assignments in the various production departments had been specially selected so that the trainees could learn the work without being under undue pressure from the exigencies of day-to-day production. In some cases, special instructors on the shop floor had been made responsible for following up the apprentices during the formative and specialisation training periods. The study showed a general trend towards prolonging the period spent in the school or training bay and towards reinforcing the related instruction.

Both in the countries recruiting their workers from school and in the apprenticeship countries, undertakings were paying greater attention to the organisation of the formative training period - i.e. the period following immediately after the basic training.

It is only in the Dutch sample that the undertakings - which on the whole were fairly small - had not organised special training sections for their apprentices. They have, on the other hand, taken steps to ensure continued related instruction for all their apprentices during a period of in-plant training.

5. The "skilled worker" concept

In each of the countries included in the study the concept of a skilled worker includes a wide range of occupations. The job descriptions and the training syllabi for some specialisations such as, in particular, the toolmakers, are on the whole the same. It was evident, on the other hand, that in all four countries several persons in the samples had been classified as skilled workers not because of their present occupation (which definitely could only be classed as semi-skilled and in a few cases even as unskilled level), but simply because they had at one time or another acquired an officially recognised qualification as skilled workers or had passed through the regular period of apprenticeship. This constituted one of the greatest problems encountered in the inquiry and is the underlying reason for many of the reservations that have had to be made regarding statistical validity.

Much of the data supplied by employers and workers would appear to suggest that there is a much closer correlation or closer similarity between occupations found in plants having similar production but located in different countries, than between plants with different production in one and the same town. The officially recognised trade descriptions on which skilled worker training is built seem to have little to do with these occupational classifications.

One of the conclusions suggested by the study is that it is no longer profitable to base research and discussion of vocational training institutions - the word taken in its abstract sense - on a basically occupational classification. Vocational training is developing its own craft patterns, which differ from the occupational craft patterns. A man may receive broad training as a machinist - some years later he has become specialised on a specific machine operation requiring a high level of skill.

V. SUMMARY AND CONCLUSIONS

The project aimed at determining, by an intensive study of two samples drawn from one area in each of four countries, the training and job histories of skilled workers in the metal trades and the results obtained by different training systems. The countries had been carefully selected to represent:

- (a) predominantly school-based training (Belgium);
- (b) highly regulated apprentice training (Federal Republic of Germany);
- (c) combined school training and apprentice training (the Netherlands);
- (d) loosely-controlled apprenticeship (United Kingdom).

The samples sought were composed as follows:

- (a) persons who had passed skilled-worker metal trades examinations in 1958 (in Belgium, 1955);
- (b) skilled workers aged 21-29 who were employed in the metal trades in industry in 1963.

A comparative analysis of these samples, it was assumed, would furnish information on the relative efficiency of each system in supplying skilled workers possessing the type of skill and knowledge required by industry in the metal trades sector.

It was expected also that the project would give valuable experience on research methods which may be used in attempting to determine the action required - at national and international levels - for improving the present systems of vocational training.

In drawing conclusions from the comparisons just made, two immediate impressions are gained. Firstly, it is obvious that the generally accepted norms and concepts relating to vocational training are by no means always borne out by the real situation. Secondly, the supposed differences between the four countries studied are not nearly so great as popular opinion would lead one to believe: in almost all instances the variations relate to detail, only rarely do they concern basic principles.

Trends in the organisation of training

In three of the four countries studied, the vocational training systems are undergoing rapid change, mainly as a result of voluntary action on the part of employers. The general lines of the changes are leading towards an organisational structure much resembling the system existing in the Netherlands. Three stages are crystallising as distinct periods in the training process:

- (a) a period of orientation, trying out and training, lasting for about one year and designed to determine future streaming and to provide broad and basic knowledge; this training is given in school workshops;
- (b) a period of formative training, given for the most part in production departments or in a school, and organised in the form of a relatively large number of assignments to several machining and fitting jobs;
- (c) a period of specialisation during which the trainee learns to carry out production jobs according to adult worker standards.

In the school-based systems, both basic and formative training are given in a school before the adolescent takes up his first employment; in the apprenticeship countries, employers have organised special training facilities required for adequate instruction undisturbed by the pressures and variations of day-to-day work.

The specialisation period takes place in employment - either within or outside the officially recognised training period, as in the United Kingdom and Belgium respectively.

In the apprenticeship countries there is a clear trend towards increasingly stricter organisation and control of training throughout all three periods of training. In the school-based Belgian system this same trend is evident in the specialisation training during the first period of employment.

Small undertakings - those employing no more than a couple of hundred workers, particularly those having a relatively low proportion of skilled craftsmen on their payroll - constitute exceptions to these general trends in the development of voluntary training action.

This parallel development of the organisation of training, which means in effect that the differences in the patterns of training programmes are much smaller than they are usually assumed to be, would seem to deny all possibility of drawing conclusions regarding the relative efficiency of the systems operating in the four countries.

Age and skill

The same observation applies to the period of training. On paper there are marked differences. Skilled worker recognition is obtainable at the age of 16 in Belgium, at 16-17 in the Netherlands, at 17-18 or 19 in Germany, and at 21 in the United Kingdom, but in real life the age levels are considerably modified.

In Belgium there is a period of supervised and specially organised "adaption" and specialisation, by which the real age of full qualification is brought up towards the 17-19 age level.

In the United Kingdom, trainees are usually assigned to production work after two or three years of apprenticeship; the term used is "specialisation", but in reality the apprentices are often performing an adult worker's normal job.

In all the countries the period needed for highly skilled crafts and for promotion is prolonged beyond the termination of the officially prescribed period of training.

Related instruction

In the three case studies in which apprenticeship formed an important part of training, related instruction was given in day-time courses (day release) for one day a week.

The United Kingdom, where day-time related instruction in some cases is provided only up to the first level of qualification (City and Guilds intermediate examination) and where the drop-out rate in further technical education is comparatively high at this level (around 40 per cent), provides an interesting sidelight. It would in fact seem to indicate what is likely to happen when related instruction is considered or organised, not as a single course but as a series of courses which may be interrupted at any time by the trainees themselves.

Skilled workers lost to the craft

Wastage in training, defined as the proportion of persons who some five to ten years after the end of the official training period are found in occupations other than those for which they trained, is high in all four countries. It was not possible to determine with reasonable accuracy the rates of wastage.

This wastage, which represents a considerable loss to the industry, has three basic causes: (a) further studies and promotion; (b) assignment of skilled workers to semi-skilled work, mainly in production; (c) leaving to take up occupations outside the field of the metal trades.

In Germany and the Netherlands it is more particularly the highly and the broadly skilled workers who go on in their studies to become draughtsmen, designers, technicians and higher technicians, or to take up other work, usually in technical offices. In the United Kingdom, the tendency towards depletion of, for instance, the highly skilled toolmaker group seems to be checked by a relatively early "streaming" (at age 18) in the work assignments given to apprentices. Contrary to what is commonly believed, a relatively large number of skilled workers are assigned to supervisory posts as charge-hands or foremen fairly soon after the end of their training.

Also contrary to what might have been expected, opportunities for skilled craftsmen to become general mechanics and repair and maintenance men in other branches of industry do not seem to play a very considerable role as a motive for leaving the trade. The data collected on this point, however, may be too incomplete to draw conclusions: only a very low proportion of the former trainees were reached in the countries (Germany, the Netherlands) in which it had been assumed that such transfers were the most numerous.

Sample	In higher level jobs within the metal trades		Broadly and highly skilled metal trades craftsmen		On jobs at lower than skilled worker level		Had left the metal trades		Persons studied	
	No.	%	No.	%	No.	%	No.	%	No.	Med. age
Belgium - phase 1	40	14	27	9	199	70	21	7	287	27
Germany - phase 1	26	55	11	24	10	21	included in column 1		47	23
Netherlands - phase 1	10	16	14	23	26	43	11	18	61	24
United Kingdom	26	18	38	25	84	57	not known		148	23

The level of employment after training

The wastage is heaviest with regard to skilled workers ending up in jobs of a narrowly specialised or semi-skilled character. The local research workers as well as the employers and workers in Belgium and the Netherlands were unanimous in affirming that some 50 per cent of all persons who had gone through the full process of recognised skilled-worker training had later ended up doing more narrowly specialised work. This is a disturbing fact in view of present-day shortages at the skilled worker level, but the presence of a relatively large group of formerly skilled workers among the semi-skilled and specialised may yet prove to be an asset later on if these same workers ever require retraining on account of technical or economic change.

More disturbing perhaps are the comments in several of the United Kingdom replies to the questionnaire, according to which it would seem that all the training received by some apprentices had been for jobs of only a narrowly specialised routine character.

Drop-outs to non-craftsman jobs in other fields of economic activity accounted for close to 10 per cent of the Belgian sample, which is the most complete survey on this point. This figure would seem rather low in view of the low age at which the choice of specialisation is made (14) and the relatively long period that had passed between the date of this choice and date of the enquiry (13 years).

What is a skilled worker?

Two different types of definition are applied to the skilled worker concept in the countries studied: wage classification and formal, recognised training.

Both concepts would seem increasingly and embarrassingly out of touch with reality: the wage classification takes no account of job skill requirements and variations in grading between plants; the formally recognised training criterion leaves no room for the autodidact.

It may well be that the whole idea of a skilled worker concept - implying the existence of definable levels of "unskilled", "semi-skilled" and perhaps of "specialised" workers also - is what makes it difficult to study and describe a realistic training situation in statistical terms.

When the wage system determines the skilled worker concept, there is ample room for promotion of the more or less self-taught to skilled worker status - the proportion of workers who had climbed the hierarchical ladder in this way was about 30 per cent in both Belgium and the Netherlands. In view of the high promotion and drop-out rates referred to above and the extreme shortage of skilled workers, such a means of filling up the cadre would seem particularly important.

The information gathered in these two countries would seem to suggest, however, that (always with some exceptions) these autodidacts have insufficient opportunities or are not sufficiently encouraged to acquire the complementary related instruction and broad practical experience which it is considered important for a fully skilled worker to have. It seems irrational today to have a large proportion of skilled workers who, simply for this reason, remain semi-qualified. The solution to this problem should lie in widening opportunities for adult training.

How is the training period used?

All four countries apply rigid time limits to their training. But in the crafts covered by the survey these limits vary from three and a half years (ages 14 or 15 to 17 1/2 or 18 1/2) in Germany, to five years in the Netherlands (ages 12 to 17) and the United Kingdom (ages 16 to 21). In Germany the short period available for training seems to have induced employers to rationalise training within the framework of the detailed syllabi and examination requirements laid down by the training authorities. In the United Kingdom the long training period, and the absence of standard syllabi and examinations for practical work, seem to have caused employers to give less weight to broadness and intensity of training. A smaller proportion of the United Kingdom apprentices have broad skills and high level training than is the case in the German sample.

Attitudes to further education and training

The proportion of trainees going on to technician training courses is high in Germany and the Netherlands and relatively low in Belgium and the United Kingdom.

In Belgium this can probably be explained by the early streaming in the Belgian schools - at age 12 to 13. The low figure for the United Kingdom is more difficult to explain since skilled craftsman training and technician training in this country are partly integrated. Two reasons may be suggested: United Kingdom apprentices have to prove their worth during the first two years of training (16 to 18) to be admitted to the courses leading to the technician level. Most of the German trainees, on the other hand, only take up further studies when they reach the age of 20 or over.

The United Kingdom sample also seems to indicate that management attitudes play a decisive role in further education: this is the only explanation of the fact that some firms have many trainees going on to technician level examinations, while other firms have few or none at all.

Research methods

These conclusions are suggested in full recognition of their statistically narrow bases. The samples in all four countries were both small and incomplete. Moreover, they related to different age levels.

Despite this reservation it may be said that the design of the project and the methods used proved on the whole adequate for the purposes of the enquiry and for attaining the objectives set up. The local enquiries and the comparison of the figures obtained in the four countries would seem to provide a basis for reconsidering some aspects of the current systems of training, for disproving some widespread misconceptions of the organisation of training under the four systems studied, and for drawing conclusions regarding both the scope and the methods of the research and prospects for further research.

Standardisation

The extensive use made of national research officers proved to be of great value to the successful implementation of the project. Their intimate knowledge of the school and training systems and of the undertakings opened many doors which would otherwise have remained closed, and make it possible to carry the project through to completion in a relatively short period of time. In many cases, too, the local research officers were in a better position to verify the information given and to correct misleading statements or mistakes in the replies to questionnaires.

It must also be recognised, however, that the national and local research officers participating in the project tended to influence its implementation in a manner which in several cases made international comparison difficult. Each of them felt that the questionnaire had to be adapted to the local situation and, on his own initiative, undertook important modifications with regard to both the questions put and the analysis of the material assembled. Some of these changes were made even during the interviews: data sought in the questionnaire were not reported, and in several cases had to be retrieved after termination of the local enquiries.

It was also evident that the national and local research officers' own attitudes towards the training system sometimes coloured the manner in which the project was implemented in their respective countries. In some cases they were hampered in their reporting

by political or other considerations unrelated to research projects of this kind.

Research of this kind might perhaps achieve better results if it were to be carried out by teams of research workers - one representing international experience and one representing national and/or local experience.

The sample and the area

There are two reasons why it must be said that the size of the sample was smaller than would have been desirable. The first reason had not been foreseen in the design of the project: only a relatively small proportion of the replies received were either precise enough or detailed enough to allow the research workers to determine the exact level of the work being performed by the subjects. Consequently, in all the samples, groups of "others" had to be constituted. These groups - made up of persons at skilled and semi-skilled or specialised levels and, to some extent also, persons doing work at an unskilled level - became unduly large. On the other hand, the workers who could safely be identified as occupying posts at a skilled or highly skilled level, or who had been promoted, formed groups which were too small for statistical analysis.

The second reason is that the effects of training show up at quite different age levels in each of the four countries included in the study. It would be necessary to make further studies of this character at several different age levels - e.g., persons who left school or took an examination at skilled-worker level 12, 9, 6 and 3 years ago respectively. Similarly, the sample of skilled workers currently working in industry should have included all persons between the ages of 25 and 32.

The project covered four towns in as many countries. Each had been selected with a view to finding a sufficient number of undertakings in a given industrial sector in which a fairly large proportion of their skilled workers would in fact be doing work at a highly skilled level. Undoubtedly these selection criteria considerably biased the outcome of the study. Similar investigations carried out in areas in which the metal trades and the mechanical engineering industry were less dominant, or where quality requirements were lower, might well yield very different results.

Further research

This research project provided the bases of the tentative and rather limited conclusions recorded above. It would seem at the same time to have raised a number of questions of considerable significance for the further development and improvement of vocational training systems. It would also seem to have shown clearly that further and more comprehensive research would be desirable from both the national and the international viewpoint.

In any such further studies the questionnaire which was used in 1963 should be supplemented so as to call for data on three additional points:

- (1) the trainees' educational achievements at school;
- (2) greater precision regarding the type of assignments and work carried out by the apprentice during his periods of training on the job;
- (3) through direct observation or information provided by the immediate supervisors, the level of work carried out by the skilled workers in the plant.

It is suggested that such a wider and, to some extent, more profound research project would have to be designed as a joint national and international project to be implemented over several years. The experience already gained in this limited pilot study would seem to indicate that such a long-term broader research project could yield invaluable information on which to base further action relating to the organisation, financing and methods of vocational training.

ANNEX

O.E.C.D. INQUIRY REGARDING THE TRAINING OF SKILLED WORKERS IN THE MECHANICAL ENGINEERING FIELDS

Purpose and scope

1. The purpose of the inquiry is to gather facts relating to the basic and further training of skilled workers in trades and other occupations in the mechanical engineering field. Particular emphasis will be placed on preparation for such occupations as repair and maintenance mechanic, tool and die maker and fitter-mechanic. The inquiry will be carried out simultaneously in the following countries: Belgium, the Federal Republic of Germany, the Netherlands, the United Kingdom.
2. It is hoped that the data collected will be sufficient to permit at least preliminary conclusions to be drawn regarding the preferences of employers, having a need for workers with highly-developed skills working on fine tolerances, with respect to the manner in which these skilled workers should be trained.

Method

3. The inquiry will follow two parallel lines in each country.
4. The first line of the inquiry will concern a sample of trainees who finished the first three years of their apprenticeship or their vocational school training in 1958 (i.e. who in 1963 are about 23 years of age). Data will first be sought regarding their performance during the first years of their training (1956 to 1958), insofar as this can be found in records of school attendance, results obtained in practical and theoretical tests and examinations, etc. Secondly, information will be sought on these trainees up to the present date: how have they fared in their employment? Do they still occupy skilled-worker positions within the trade or occupation for which they were trained? Have they left the mechanical engineering field for work in another industry? Have they been promoted? Thirdly, an attempt will be made to record in each individual case whether the trainee has acquired further training either at his own level or with a view to promotion to the rank of technician, supervisor, etc.
5. The second line will consist of an inquiry among a sample of undertakings of varying sizes and importance. The employers concerned will be asked to name and whenever possible to supply complete data about the training and work experience of their skilled workers aged 21 to 25. The group of skilled workers studied should include technicians and supervisors, if any, who were initially engaged by the undertaking at the skilled-worker level.

The inquiry addressed to the employer will be followed up by a personal questionnaire to the individual employee(s) concerned, asking them to supply information about the basic and further training received by them in their present and previous employment(s) since their first day of employment or their training at a technical or vocational school.

6. Each line of the inquiry will be restricted to a limited sample. It is hoped to assemble for each country complete histories of about 200 persons who were vocational education students in 1958 (first line) and about 100 skilled workers (second line).

QUESTIONNAIRE

A. Questions to be answered by vocational schools only:

1. If possible, please supply full records about the training given to (say) six classes of metal trades mechanical engineering trainees (apprentices and vocational school trainees) who received practical and related instruction in your school in 1958, after having completed at least two years of basic practical and theoretical instruction.
2. Have you changed the content of or otherwise reorganised these courses during the past five years?
3. Has your school any records which would help to trace the subsequent employment history of the members of the above-mentioned classes, so as to ascertain what further training they may have undergone and what level of work they are at present performing in industry?
4. Has your school, or any other institution you know of, undertaken any similar study relating to other years - or to the class of 1958 - which would be useful to the present study?

B. Questions to be answered by industrial undertakings:

1. Within the framework of the present study could you supply a complete list of skilled workers, aged 21-25, at present in your employment as repair and maintenance mechanic, as tool and die maker, as fitter-mechanic, or in another of the mechanical engineering trades? The list should not exceed 50 names.
2. Please indicate how these workers were recruited.
3. For each of the skilled workers listed, please supply as complete a record as is possible regarding the training - basic and further training, including specialised training and training for promotion - given to these persons by your company.
4. For the same group of skilled workers, please indicate the principal work assignments carried out by them during their employment in your undertaking: special responsibility for a group of machines, responsibility for the work of others, responsibility for part of the tools and equipment, etc.

Note: It is intended to address a separate series of questions to the workers concerned, and to ask them for further information regarding their individual practical experience and related instruction and such further training as they may have acquired, either with other employers or on their own initiative in evening schools or otherwise.

C. Questions to be answered by the skilled workers:

1. Please furnish a complete list of the principal work assignments - special responsibility for a group of machines, responsibility for the work of others, responsibility for a part of the tools and equipment - which you have had
 - (a) during the period of your training
 - or (b) while employed as a skilled worker.
2. Please indicate the approximate duration of each assignment.
3. Please indicate against each assignment whether, in your opinion, it was of value for the development of the skills which you need for your present trade.